

Claims

1. A method for fabricating improved graphite granules, comprising the steps of:
preparing a surface modifying solution by mixing a pre-determined amount of a
5 surface modifying agent in a corresponding solvent of said surface modifying agent;
immersing unimproved graphite granules in said surface modifying solution;
stirring said unimproved graphite granules in said surface modifying solution at
predetermined speed for a predetermined time period to form coated graphite granules;
separating said coated graphite granules from said surface modifying solution;
10 heating to dry said coated graphite granules;
sifting said coated graphite granules;
solidifying said coated graphite granules in an inert environment at a
predetermined temperature for a predetermined period of time; and
carbonizing said solidified graphite in an inert environment at a predetermined
15 temperature for a predetermined period of time to form said improved graphite granules.
2. The method of claim 1 wherein the average granule diameter of said unimproved
graphite granules is between $7\mu\text{ m}$ and $35\mu\text{ m}$.
- 20 3. The method of claim 1 wherein 1.5 liters to 3 liters of said surface modifying

solution is used for every 1 kg of said unimproved graphite granules.

4. The method of claim 1 wherein said surface modifying agent is one or more polymers selected from the group consisting of: coal pitch, coal tar, petroleum pitch, petroleum coke, benzene, naphthalene, copolymers of benzene and naphthalene copolymer, petroleum wax and petroleum resin.

5. The method of claim 1 wherein said corresponding solvent is an organic solvent selected from the group consisting of: acetone, anhydrous ethanol, N- methyl pyrrolidone, chloroform, tetrahydrofuran, carbon tetrachloride, and cyclohexane.

6. The method of claim 1 wherein said unimproved graphite granules is stirred in said surface modifying solution at 100rpm to 2000 rpm for 0.5 hours to 10 hours.

7. The method in claim 1 wherein said in solidifying step, solidification proceeds at 200°C to 600°C for 0.2 hour to 12 hours.

8. The method of claim 1 wherein the rate of increase in temperature in said solidifying step is 0.5°C/min to 35°C/min.

9. The method of claim 1 wherein in said carbonizing step, carbonizing proceeds at 750°C to 1300°C for 1 hour to 24 hours.

10. The method of claim 1 wherein the rate of increase in temperature for said carbonizing step is 0.1°C/min to 30°C/min.

11. The method of claim 6 wherein 1.5 liters to 3 liters of said surface modifying solution is used for every 1 kg of said unimproved graphite granules.

12. The method of claim 6 wherein the average granule diameter of said unimproved graphite granules is between 7μ m and 35μ m, and 1.5 liters to 3 liters of said surface modifying solution is used for every 1 kg of said unimproved graphite granules.

13. The method of claim 7 wherein in said solidifying step, the rate of increase in temperature for solidification is 0.5°C/min to 35°C/min.

14. The method of claim 9 and, in said carbonizing step, the rate of increase in temperature for said carbonization is 0.1°C/min to 30°C/min.

15. The method of claim 13 wherein in said carbonizing step, carbonization proceeds

at 750°C to 1300°C for 1 to 24 hours and the rate of increase in temperature for said carbonization is 0.1°C/min to 30°C/min.

16. A method for fabricating improved graphite granules, comprising the steps of:

5 preparing a surface modifying solution by mixing a pre-determined amount of a surface modifying agent in a corresponding solvent of said surface modifying solution wherein said surface modifying agent is one or more polymers selected from the group consisting of: coal pitch, coal tar, petroleum pitch, petroleum coke, benzene, naphthalene, copolymers of benzene and naphthalene copolymer, petroleum wax and petroleum resin;
10 and said corresponding solvent is an organic solvent selected from the group consisting of: acetone, anhydrous ethanol, N- methyl pyrrolidone, chloroform, tetrahydrofuran, carbon tetrachloride, and cyclohexane;

immersing said unimproved graphite granules in said surface modifying solution wherein the average granule diameter of said unimproved graphite granules is between 7
15 μ m and 35 μ m and 1.5 liters to 3 liters of said surface modifying solution is used for every 1 kg of said unimproved graphite granules;

stirring said unimproved graphite granules in said surface modifying solution at 100rpm to 2000 rpm for 0.5 hours to 10 hours to form coated graphite granules;

separating said coated graphite granules from said surface modifying solution;

20 heating to dry said coated graphite granules;

sifting said coated graphite granules;

solidifying said coated graphite granules in an inert environment at 200°C to 600°C for 0.2 to 12 hours wherein the rate of increase in temperature for solidification is 0.5°C/min to 35°C/min; and

5 carbonizing said coated solidified graphite in an inert environment at 750°C to 1300°C for 1 to 24 hours to form said improved graphite granules wherein the rate of increase in temperature for carbonization is 0.1°C/min to 30°C/min.

17. An improved graphite granule, comprising:

10 an unimproved graphite granule; and

a membrane of amorphous carbon enveloping said unimproved graphite granule, wherein the thickness of said amorphous carbon membrane is between 0.05μm and 1μm.

18. Said improved graphite of Claim 17 wherein the crystallite interlayer spacing in

15 said improved graphite granules, d_{002} , is between 0.335nm and 0.340nm; the specific surface area of said improved graphite granules is between 1.3 m²/g and 4.2 m²/g; and the average granule diameter of said improved graphite granules is between 8μm and 35μm.

19. Said improved graphite of Claim 17 wherein said improved graphite granules are

20 fabricated using the method, comprising the steps of:

preparing a surface modifying solution by mixing a pre-determined amount of a surface modifying agent in a corresponding solvent of said surface modifying solution;

immersing said unimproved graphite granules in said surface modifying solution;

stirring said unimproved graphite granules in said surface modifying solution at

5 predetermined speed for a predetermined time period to form coated graphite granules;

separating said coated graphite granules from said surface modifying solution;

heating to dry said coated graphite granules;

sifting said coated graphite granules;

solidifying said coated graphite granules in an inert environment at a

10 predetermined temperature for a predetermined period of time; and

carbonizing said coated solidified graphite in an inert environment at a predetermined temperature for a predetermined period of time to form said improved graphite granules.

15 20. Said improved graphite of Claim 19 wherein said the interlayer spacing of the said graphite granules, d_{002} , is between 0.335 and 0.340nm; the specific surface area of said improved graphite granules is between 1.3 m²/g and 4.2 m²/g; the average granule diameter of said improved graphite granules is between 8 and 35μm.